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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/608,169
Filing Date: June 26, 2003
Appellant(s): MCINTYRE ET AL.

Mark A. Wurm (Reg. No. 31,682)
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 11/29/2005 appealing from the Office action mailed 5/27/2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

No evidence is relied upon by the examiner in the rejection of the claims under appeal.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 6-8, 10-11, 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Huber (US 5,159,601).

Regarding claims 1, 3, 6-7, Huber discloses a photonic circuit (Fig. 1) comprising a resonator in the form of grating 18, which is part of a tunable fiber laser, means for heating the resonator in the form of resistive heater 24, means for measuring a temperature of the grating in the form of thermistor 26, means for coupling the thermistor to the heater in the form of circuit 28, wherein the thermistor measures the temperature of the grating and transmits signals to the voltage source 30, in order to increase or decrease the amount of heat provided to the heater, so that the grating period is adjusted accordingly, for changing the wavelength of the light being passed through the grating and out of the laser cavity (line 43, col. 2 to line 10, col. 3). It is noted

that in order for the system to associate a measured temperature with a desired temperature (which would cause the laser to emit the desired wavelength), it is inherent that some kind of logic is used (e.g., in the simplest form whether a measured temperature is equal or not to a set temperature).

Regarding claim 2, grating 118, heater 24 and thermistor 26 are embedded in substrate 22 (lines 52-58, col. 2).

Regarding claim 8, the temperature of the grating is sensed by a change in the change of the temperature (and hence the resistance) of the thermistor 26.

Regarding claim 13, it is inherent that during the operation of the circuit of Fig. 1, each selected wavelength for the resonator corresponds to a respective temperature, the list of which temperatures and wavelengths constituting a lookup table.

Regarding claims 10-11, heater element 26, and thermistor 26 are in series, therefore having the same current flowing through them, the current being increased or decreased in response to the measurement of the resistance of the thermistor wire (via Ohm's law), and correspondingly, increasing or decreasing the temperature of the grating.

> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 3-4, 6-7 are rejected under 35 U.S.C. 102(e) as being anticipated by Ueda (US 6,498,878).

Regarding claims 1, 3, 6-7, Ueda discloses a photonic circuit (Figs. 2-3) comprising a resonator in the form of arrayed waveguide grating 14, which is part of a WDM

multiplexing/demultiplexing integrated optical circuit, means for heating the resonator in the form of thin film heater 22, means for measuring a temperature of the grating in the form of temperature detector 25, means for coupling the thermistor to the heater in the form of a feedback circuit (not shown), wherein the temperature detector measures the temperature of the arrayed grating and transmits signals to a current source, in order to increase or decrease the amount of heat provided to the heater, so that the difference between adjacent waveguides is adjusted accordingly, for changing the routes of wavelengths of the light being passed through the arrayed grating (line 23, col. 4 to line 41, col. 4). It is noted that in order for the system to associate a measured temperature with a desired temperature (which would cause the arrayed grating to perform the multiplexing/demultiplexing according to a designed protocol), it is inherent that some kind of logic is used (e.g., in the simplest form whether a measured temperature is equal or not to a set temperature).

Regarding claim 4, the circuit is used for photonic switching, i.e., for switching wavelengths between the various input and output channels.

Claims 1, 3, 6-8, 10-11 are rejected under 35 U.S.C. 102(e) as being anticipated by Eggleton (US 6,438,277).

Regarding claims 1, 3, 6-7, Eggleton discloses a photonic circuit (Fig. 1) comprising a resonator in the form of a thermally sensitive optical element 11 which may be a grating, a resonance ring or a solid body resonance cavity, which is part of a waveguide circuit 10, means for heating the resonator in the form of heater 12, means for measuring a temperature of the resonator 11 in the form of temperature-dependent resistive element (not shown), means for

coupling the temperature sensor to the heater in the form of a feedback circuit 14 wherein the temperature detector measures the temperature of the resonator and transmits signals to a current source, in order to increase or decrease the amount of heat provided to the heater, so that the temperature sensitive resonator changes its wavelength response (line 64, col. 2 to line 37, col. 3). It is noted that in order for the system to associate a measured temperature with a desired temperature (which would cause the grating to transmit or reflect the desired wavelength), it is inherent that some kind of logic is used (e.g., in the simplest form whether a measured temperature is equal or not to a set temperature).

Regarding claims 8, 10-11, the change in the temperature is measured by measuring the resistance of wire 12, using a resistance detector 16 , an ohmmeter, which in effect calculates the resistance by taking the values of a voltage and a current across the line (lines 5-11, col. 3).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 5, 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huber (US 5,159,601) in view of Koizumi (US 5,696,543).

Huber discloses all the limitations of the above claims except for specifying that the metal wire of the temperature sensor is aluminum. Koizumi discloses a temperature sensor device wherein an aluminum wire is used as temperature sensor element 6 (Fig. 1, lines 44-56,

col. 3). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use an aluminum wire as a simple temperature sensor, as taught by Koizumi, since aluminum has very good thermal properties in terms of its thermal coefficient.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Huber (US 5,159,601) in view of Schwindt (US 6,720,782).

Huber discloses all the limitations of the above claim except for specifying that during the measurement of the resistance of the wire, the value of voltage is taken by using a voltmeter connected to the wire via a Kelvin connection. Schwindt discloses a measurement probe used in conjunction with low-current and low-voltage measurements of wafers and other electronic test devices, wherein he teaches that a voltmeter may be connected to an interconnection point which comprises a Kelvin connection (lines 26-65, col. 1). It would have been obvious to one of ordinary skill in the art at the time the invention was made to connect the voltmeter to the wire via a Kelvin connection in the device of Huber, as taught by Schwindt, since Kelvin connections compensate for voltage losses caused by line resistances which would otherwise cause errors in low-voltage measurements (lines 52-54, col. 1 in Schwindt).

(10) Response to Argument

a) Arguments regarding the Huber (US 5,159,601) reference

The main argument of Appellant is that the grating 18 in Fig. 1 of Huber is a mirror and not a resonator ("The Office Action states that Huber discloses a resonator in the form of a grating 18...[T]he grating 18 in Huber is a mirror..."), see p. 6 of the Appeal Brief. It is

respectfully submitted that Appellant has misunderstood the description of grating 18 in the Office Action of 5/27/2005. The grating 18 constitutes a partially transmitting mirror which is an integral part of the optical fiber laser 17, which by definition is a resonator. Generally, a resonator is a device that under certain conditions achieves a specific operational condition, the so called resonance condition. It is noted that Appellant has not provided a definition or a description of what a "resonator" is, other than stating in couple occasions that "Used as a switch, a photonic resonator can be turn on, i.e., permit the passage of light of a certain frequency, or turned off, i.e., not allow the passage of light of a certain frequency', see [00002] of Disclosure. Huber's laser is an optical resonator, which depending on certain parameters, such as the physical properties of the optical cavity (comprising mirror 14, partial mirror/grating 18 and the length of optical fiber 16 between said two mirrors), achieves resonance condition for lasing, i.e., emitting light of specific only wavelength/frequency. The presence of heater 26 affects the conditions of the laser cavity to affect the resonance condition of the laser/resonator. Finally, even though Appellant states that "the resonator recited in claim 1 of the present application has its refractive index altered by changes in temperature...thereby changing the frequency selected by the circuit", see p. 6 of the Appeal Brief, it is noted that the claim language of claim 1 does not recite any limitation related to change of the refractive index by changes in temperature.

Next, Appellant argues that since "Huber refers to a laser, not a photonic switch, [he] does not disclose the precise control of the present invention" (as opposed to the present invention where the temperature of the resonator is adjusted in order to precisely control the frequency selected by the photonic circuit), see p. 7 of the Appeal Brief. In addition, Appellant

further argues that "Huber does not disclose either a processor or a memory such as disclosed and claimed by the present invention for the precise control of selected frequencies." First, the claim language of claim 1 does not include the word "switch". Second, Huber clearly teaches that the combination of the heater element 24 along with thermistor 26 and feedback circuit including difference amplifier 28 "tune[s] the laser wavelength" and "provide[s] precision control of the grating", see lines 55-61, col. 2. The above clearly show the existence a "processor" and a "memory", since the control operation requires that a *sensed* temperature must be constantly *compared* against a *list* of corresponding desired values of wavelengths, so that the grating is *adjusted*, and consequently the wavelength of the light emitted by the laser cavity is chosen.

Finally, Appellant argues that the control system in Huber does not include "logic associating one or more frequencies of light to one or more temperatures of said resonator", see bottom of p. 7 in Appeal Brief. The Examiner respectfully submits that the feedback control operation described above is not possible unless there is some logic (not necessarily complex) that associates sensed temperatures (and corresponding wavelengths) with target temperatures (and corresponding wavelengths).

b) Arguments regarding the Ueda (US 6,498,878) reference

Appellant's main argument regarding Ueda, is that the waveguide grating 14 of Fig. 2 is not a resonator. As described above, Appellant has not defined what a "resonator" is, only stating what the resonator does ("In the present application, the temperature of the resonator directly affects the refractive index of the resonator, thereby determining the frequency selected by the circuit.") see sentence bridging pages 8 and 9 in Appeal Brief. In this sense, this is exactly what

occurs in the device of Ueda, where changes in the temperature of the arrayed waveguides 14 affect their relative length and positioning (by changes to their refractive index), resulting in the center wavelength of each of the output waveguides 16 coinciding with the desired wavelength (i.e., the "resonance" condition), see lines 33-41, col. 4.

Regarding Appellant's next argument about the allegedly Ueda's lack of disclosure of a processor or a memory that is used to precisely select a frequency, it is respectfully submitted that, in a similar fashion as with the device of Huber, the feedback control operation that achieves the aforementioned resonance condition would not be possible but for the existence of a processor and a memory element.

Next, Appellant argues that "Ueda is not concerned with selecting temperature frequency pairs in order to select a precise frequency in a photonic circuit", see p. 9 of Appeal Brief. The examiner notes that the feedback control system in Ueda is used to ensure that a plurality of output waveguides emit a wavelength that is substantially close to a desired one, which implies that a plurality of temperature/frequency pairs is stored, and selected during the operation of the device.

Finally, for the reasons given above, the feedback control system of Ueda's device must incorporate some kind of logic that is capable of comparing sensed values of the temperature of the waveguides with target values and appropriately effecting changes in order to produce a target wavelength at each of the output waveguides.

c) Arguments regarding the Eggleton (US 6,438,277) reference

Appellant argues that the present invention "is not directed to stabilizing a device like Eggleton, but rather, is directed to precisely controlling a photonic switch by selecting

temperature/frequency data from a logic device, and adjusting the temperature of the resonator to that temperature, thereby precisely controlling the frequency selected by the photonic circuit", and furthermore that Eggleton does not disclose precise temperature/frequency logic means to select a particular frequency, or that said control is infinity variable, see p. 10 in Appeal Brief. First, nowhere in the language of claims 1, 3 6-8, 10-11 is there a mention of a photonic "switch". Second, even though Eggleton only mentions that the feedback control is used to stabilize the circuit against ambient changes of temperature (lines 18-25, col. 3), it is noted that Eggleton clearly states that the controller 15 receives a primary control signal indicative of a desired setting for the tunable optical device (lines 9-11, col. 3), i.e., the device is tunable (implying multiple temperature/wavelength pairs). However, in any case, it is noted that the claim language recites *one* or more frequencies and *one* or more temperatures (emphasis added), hence Eggleton does contain the disputed limitation.

d) Arguments regarding the Office Action's response to Appellant's previous arguments.

Appellant argues that the thermistor 26 and the difference amplifier 28 in Huber do not constitute processing means and a type of data storage (see p. 12 in Appeal Brief). The examiner respectfully submits that the above elements are means of processing (e.g., sensing/converting temperature to current) and data storage (holding and comparing a target value with sensed values).

Finally, Appellant argues that a feedback system (not explicitly shown) in Ueda could be hard-wired, without a processor or memory. Again, as explained above, the nature of the

feedback control operation disclosed in Ueda implies that a processor and a memory unit must be present for the system to work.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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